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In Search of `the Appropriate' Unit of Analysis for Sociocultural Research

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Abstract The polysemic notion of 'unit of analysis' has been developed by Gestalt psychologists and fruitfully used by Vygotsky in the struggle against reductionism in psychology. Currently, it has been appropriated by a sociocultural approach for criticizing cognitive approaches for using the 'individual as unit of analysis'. In this article, I argue that a sociocultural approach is experiencing a crisis as it is being affected by holism—a tendency to include the universal whole in the studied phenomenon. I propose and discuss alternatives to reductionism and holism for a sociocultural approach.

Key Words dialogism, holism, reductionism, sociocultural approach, unit of analysis

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In Search of 'the Appropriate' Unit of Analysis for Sociocultural Research

In professional educational/psychological conferences I often hear the question 'what is the appropriate unit of analysis?' directed to scholars working within a sociocultural approach. The answer typically goes along the lines that the 'individual is a traditional but wrong unit of analysis' and that the appropriate unit of analysis for sociocultural research should be: word meaning (Vygotsky, 1987), mediated action (Wertsch, 1994; Zinchenko, 1985), activity (Davydov & Radzikhovskii, 1985; Rogoff, 1990), activity system (Engeström, Miettinen, & Punamèaki-Gitai, 1999), activity systems (Engeström, 2004), person-in-the-world (Brushlinsky, 1990; Lave & Wenger, 1991), event (Rogoff, 1990), utterance (Bakhtin, 1986), or community of practice (Wenger, 1998). The list could probably continue. Although I agree with many of these scholars about the critique of the 'individual as a wrong unit of analysis' and I like the list of the cited units of analysis, I am still puzzled about the issue of the appropriate unit of analysis. The aforementioned sociocultural scholars definitely preferred certain units of analysis not just for some of their empirical studies but, it seems, in general or even universally. When they move from one unit of analysis

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to another one as 'the unit', they seem to be saying that now they have discovered a better one. However, my contextual 'upbringing' warns me against universal and context-free methodological constructs. Working within a sociocultural framework, I have learned that we, sociocultural scholars, should be careful in our search for the general or even the universal unit of analysis because the unit(s) of analysis as well as the analysis as a whole analysis is necessarily shaped by the purpose of the researcher and the material of the study. How can a certain unit of analysis be universally appropriate for any sociocultural research, disregarding its purpose, the object and subject of study, the targeted audience, expected practical and political consequences, and the researchers themselves? This puzzlement led me to explore this issue in this article, the purpose of which is to understand the polysemy of the notion of analysis, its history and current use, and issues of the unit of analysis especially within a sociocultural approach.

Guided by a sociocultural approach to consider issues historically, I looked into the history of the construct 'unit of analysis'. I found that historically, and still today, the notion of 'unit of analysis' has been used for methodological critique of research of others—as a rhetorical argument often to critique research that is done in another, competing, research paradigm. At the beginning of the 20th century German Gestalt psychologists, like Köhler and Muller-Frienfels, criticized associationists for using overly small units of analysis (associations of unrelated bits of information) that destroy the studied phenomenon (e.g. memory) (Valsiner, 1988; van der Veer & Valsiner, 1991; Wertsch, 1985b). The Gestalt psychologists provided the following famous chemical example that Vygotsky liked so much and cited in his work. I would like to present a long quote from Vygtosky so that the reader can capture the nuances of the argument,

> The first of these forms of analysis [in studies by others criticized by Vygotsky] begins with the decomposition of the complex mental [psychological] whole into its elements. . . . The essential feature of this form of analysis is that its products are of a different nature than the whole from which they were derived. The elements lack the characteristics inherent in the whole and they possess properties that it did not possess. When one approaches the problem of thinking and speech by decomposing it into its elements, one adopts the strategy of the man [person] who resorts to the decomposition of water into hydrogen and oxygen in his search for a scientific explanation of the characteristics of water, its capacity to extinguish fire or its conformity to Archimedes law for example. This man will discover, to his chagrin, that hydrogen burns and oxygen sustains combustion. He will never succeed in explaining the characteristics of the whole by analyzing the characteristics of its elements. Similarly, a psychology that

> decomposes verbal thinking into its elements in an attempt to explain its characteristics will search in vain for the unity that is characteristic of the whole. These characteristics are inherent in the phenomenon only as a unified whole. When the whole is analyzed into its elements, these characteristics evaporate. In his attempt to reconstruct these characteristics, the investigator is left with no alternative but to search for external, mechanical forms of interaction between the elements.
>
> . . . the chemical formula of water, that relates equally to all of its chrematistics, equally applies in general to all of its kinds, to an equal degree to the Pacific Ocean as well as a raindrop. That is why the analysis of water into its elements [i.e. hydrogen and oxygen] cannot serve as the way that brings us the explanation of its concrete characteristics . . . [Vygotsky, 'Thinking and Speech', cited in Valsiner, 1988, p. 177].[1]
>
> In our view, an entirely different form of analysis . . . relies on the partitioning of the complex whole into units. In contrast to the term 'element,' the term 'unit' designates a product of analysis that possesses *all the basic characteristics of the whole*. The unit is a vital and irreducible part of the whole. . . . In precisely the same sense, the living cell is the real unit of biological analysis because it preserves the basic characteristics of life that are inherent in the living organism.
>
> A psychology concerned with the study of the complex whole must comprehend this. It must replace the method of decomposing the whole into its elements with that of partitioning the whole into its units. Psychology must identify those units in which the characteristics of the whole are present, even though they may be manifested in altered form. (Vygotsky, 1987, pp. 45–47)

Indeed, such physical and chemical features of water as its transparency, lack of smell, capability to extinguish fire, and so on, cannot be understood by studying the atoms or even a separate molecule of water. Ice, liquid water and steam have the same atoms and molecules but have many different physical features that can be only understood by the investigation of relationships among many molecules of water. Thus, atom and even molecule are wrong units of analysis from the listed phenomenon of water. Similarly, Vygotsky argued that reflexes are wrong units of analysis for the study of complex human behavior.

I want to make at least four observations about Vygotsky's methodological reasoning as borrowed from Gestalt psychologists. First, the notion of 'unit of analysis' is polysemic: the term 'unit' is used in at least two different meanings: descriptive and prescriptive. When Vygotsky talked about 'unit of biological analysis' in the quote above, he meant the smallest object of analysis used in the research. This is arguably a descriptive definition of the unit of analysis. However, when he compared 'elements' and 'units', by 'unit' he meant a specific relationship between the phenomenon of the researcher's interest and the object

of investigation. This is a prescriptive definition as Vygotsky considers what kind of unit of analysis must be for good research. I will later discuss in detail this issue of a prescriptive notion of unit of analysis.

Second, Vygotsky (and Gestalt psychologists before him) admitted the usefulness of studying elements such as reflexes and associations when the researcher is focused on a lower-level phenomenon. For example, Vygotsky would accept reflex as a unit of analysis for studying certain consequences of brain damage (e.g. an iris closing in reaction to light). A unit of analysis may not be appropriate for studying one phenomenon but may be appropriate for studying another. In contrast, contemporary scholars working within a socio-cultural framework would apparently not admit the usefulness of studying the 'individual as unit of analysis' for whatever phenomenon. Thus, it appears that currently we are dealing with a different issue.

Third, Gestalt psychologists and Vygotsky insisted on selecting and studying only a phenomenon that is self-contained and involves the unified smallest whole, 'a continuously repeating, mass like phenomenon' (Pletnikov, 1990, p. 46)—'Gestalt' (in German). Their physical examples of homogeneous physical objects like water or air supported the idea of partitioning phenomena into units. Studies guided by situated cognition and feminist approaches (Gilligan, 1993; Lave, 1988) challenge this assumption about the homogeneity of psychological phenomena. In this article, I raise the issue of whether in studies of human activities this partitioning is always (or even ever) possible.

Finally, it is interesting that Gestalt psychologists and Vygotsky modeled participants in psychological phenomena, who often have a voice and can participate in discourse, after physical voiceless phenomena. Research in social studies addresses the people whom it studies directly or indirectly, willingly or unwillingly, which destroys the unit–element structural hierarchy proposed by the Gestalt psychologists and Vygotsky. It raises the issue of how much the social sciences can be made in the image of the natural sciences. This problem was well articulated by Bakhtin (1986):

> The exact sciences constitute a monologic form of knowledge: the intellect contemplates a *thing* and expounds upon it. There is only one subject here-cognizing (contemplating) and speaking (expounding). In opposition to the subject there is only a *voiceless thing*. Any object of knowledge (including man) can be perceived and cognized as a thing. But a subject as such cannot be perceived and studied as a thing, for as a subject it cannot, while remaining a subject, become voiceless, and, consequently, cognition of it can only be *dialogic*. Dilthey and the problem of understanding. Various ways of *being active* in cognitive activity. The activity of the one who acknowledges a voiceless thing and the activity of one who acknowledges

> another subject, that is, the *dialogic* activity of the acknowledger. The dialogic activity of the acknowledged subject, and the degrees of this activity. The thing and the personality (subject) as *limits* of cognition. Degrees of thingness and personality-ness. The event-potential of dialogic cognition. Meeting. Evaluation as a necessary aspect of dialogic cognition. (p. 161)

The organization of this article is non-linear but a bit circular (or, better, spiral) as I am going to go deeper in the arguments that I just presented. First, I discuss the definition and usefulness of the notion of unit of analysis in educational/psychological research. Then, I will turn to issues with the unit of analysis and how this notion has been historically used for the critique of research for its methodological and conceptual reductionism, especially by sociocultural scholars (in a broader sense). From their critique, I will turn to critique of how sociocultural scholars use the notion of the holistic unit of analysis themselves. I will discuss negative ontological, conceptual and methodological consequences of holism that sociocultural scholars employ by focusing on *the* unit of analysis. Finally, I will outline a proposal of how to avoid both reductionism and holism.

Descriptive Notion of Unit of Analysis

From a narrow descriptive methodological point of view, *unit of analysis* is the smallest object of analysis in a study. For example, in Köhler's famous experiments with apes (1973), the smallest object of analysis—his unit of analysis—was a process of problem-solving where a direct way of solving the problem is not possible for an animal but 'a roundabout way' of solving the problem is available (e.g. getting a banana that is located outside of an ape's reach while there is a long enough stick available in the cage). For Piaget's empirical investigations, his unit of analysis often was a process of problem-solving involving a reversible mental operation (e.g. an infant sees the experimenter hiding a toy under a cover—for the child to mentally perceive the object as permanent, she or he has to uncover the object and, thus, to reverse the action of the experimenter). For many contemporary cognitive psychologists, their unit of analysis is the transfer of a specific means of problem-solving from a learned decontextualized problem to another, new decontextualized problem (see, for an example of such research, Kotovsky, Hayes, & Simon, 1985).

Zinchenko (1985) discusses different units of analysis that are used for several of the most known psychological theories,

> As is known, the problem of units for psychological research has confronted every school of scientific psychology. In the past, a variety of phenomena

> have been singled out in this capacity. For example, sensations (in associationism), figure–ground (in Gestalt psychology), the reaction or reflex (in reactology and reflexology respectively), set (in set psychology), and the behavioral act (in behaviorism) have served as units. In neobehaviorism in particular Tolman treated the problem of analytic units as central. Subsequently, Tolman's work has had a substantial influence on contemporary cognitive psychology. Tolman supplemented the stimulus–response scheme with a system of intervening, variable, cognitive maps organized in quasi-spatial form. In Western European psychology, Piaget discussed the problem in particular detail. He singled out reversible operations in this connection. These operations were part of a wider operative structure. According to Piaget, action is the source of these internalized operative structures. In contrast to reversible operative structures, other investigators have viewed mnemonic and motor schemes as the units of analysis. This is characteristic of Bartlett (1935) and several of his followers in contemporary Anglo-American psychology. (p. 95)

Zinchenko points out that, unlike the listed researchers, others do not use a consistent unit of analysis across their scholarship. Some developmental stage psychologists used different units of analysis depending on different stages. Some scholars, like Freud, rejected universal units of analysis in their research but rather developed specific taxonomies for units of analysis.

The notion of 'unit of analysis' helps to articulate and address many methodological issues. Kenny (2003) listed several issues that can affect statistical analysis in quantitative research in social psychology, such as independence, sampling, consistency, nesting, and so on. The unit of analysis helps to operationalize the phenomenon and, thus, to allow its measurement in a quantitative study. For example, Rogoff and her colleagues (Rogoff, Göncü, Mistry, & Mosier, 1993) studied attention patterns across different cultures. They operationalized attention as mother–infant reactions to meaningful events competing for their attention (i.e. unit of analysis). They counted the frequency of simultaneous versus alternating attention in response to competing events in dyads from four different cultures. These frequencies represented quantitative patterns characterizing these four cultures. However, as I will show below, the notion of unit of analysis is important not only for quantitative but also for qualitative research. Here I will discuss three known problems relevant to the purpose of this article (of course, there are many more problems with the unit of analysis but they are outside of the scope of this article).

Known Issues with Unit of Analysis Relevant to the Article

The Problem of Consistency

This issue of consistency of unit of analysis is especially important for quantitative research, but it is also relevant for qualitative research, although to a lesser degree. In measurement, any researcher has to count the same units. The units of analysis can be qualitatively or quantitatively different for different counts within the same research, but within the same count the units should be the same. Shifting to another unit of analysis can produce a situation of 'adding apples and oranges'. For example, in research on parental authority (like, for example, in Baumrind, 1971), it would be problematic to add 'authoritarian families' and 'authoritarian parents' together because these two variables represent two different units of analysis: family in the former case and individual parents in the later (unless, of course, the unit can be defined to include both, like fruits for apples and oranges). The two units may not only represent quantitatively different units—family often consists of two parents, not one—but also a qualitative difference. Parental authority can be constructed not only by the parent him- or herself, but also by the child—the parent can manifest different parental styles with different children in the family—and/or family members (and even non-family members) and/or family circumstances.

Different units of analysis can lead to different generalizations, which is important in qualitative research as well. For example, in our research on the ways parent volunteers and children organize guidance in small groups in an innovative collaborative school (Matusov, Bell, & Rogoff, 2002; Matusov & Rogoff, 2002), we found that individual parent volunteers seemed to be responsible for a type of guidance in a small group. However, when we studied children without parents within the collaborative school, we found that the children often initiated a collaborative type of guidance in contrast to the children from a traditional school. Thus, in the former case, we can generalize about parent volunteers working with small groups of children, while the later case focuses on innovative collaborative schools. The conclusions drawn from an analysis conducted at an institutional level may not apply at the individual level, and vice versa. In principle, the analysis should be conducted at the level at which generalizations should be made (Robinson, 1950).

Different units of analysis lead to different generalizations. For some important goals, a study can legitimately have different units of

analysis—the differences in units of analysis have to be taken into consideration for measurement and generalization purposes.

The problem of consistency of the unit of analysis is a 'bottom-up' methodological problem: analysis affects its interpretation with regard to the targeted phenomenon. Now I will turn to a relational methodological problem of unit of analysis in which the targeted phenomenon and analysis define each other.

The Problem of Construct Validity

The problem of construct validity refers to a danger that the conceptualized phenomenon of interest is not adequately addressed in the study. A researcher is interested in one thing while she or he is, in actuality, studying another thing. This issue of matching the relationship between the conceptual goals of the research and its methodological means is of interest here. The unit of analysis can be smaller than the conceptualized construct of the phenomenon. For example, a study intended to investigate anxiety uses a physiological reaction (e.g. sweating) as the unit of analysis of anxiety and leaves out other important components of anxiety such as thoughts, actions and uncontrolled behavior. The unit of analysis can be bigger than the conceptualized construct of the phenomenon. For example, a study intended to investigate a student's learning after taking a class uses a standardized multiple-choice test as the unit of analysis of learning. The test is assumed to measure the student's learning but it also can include the student's anxiety and mastery of test-taking in general. Finally, the unit of analysis may have little to do with the conceptualized construct of the phenomenon altogether. For example, research participants may provide their guesses about what results the researcher wants from them rather than replying in ways the researcher expects (also known as 'the Hawthorne effect'). Or a researcher may select a unit of analysis because the research method for which this unit of analysis will be used is well developed and not because it is the best fit for the study of the conceptualized construct of the phenomenon.[2] For example, a researcher who studies problem-solving through (videotaped) social interaction excludes participants' moment-to-moment goals and intentions because the participants' goals and intentions were not publicly available through the videotaped observations—the method that the researcher privileged and knows best—although the researcher believes that problem-solving is a goal-directed process. There are many other possibilities of threatening the construct validity (see Hartmann, 1992, for more discussion, pp. 64–67). Essentially, methodological problems with unit of analysis often lead to the issue

of construct validity because the wrong unit of analysis undermines the relationship between the analysis itself and the studied phenomenon. Now I will turn to a specific problem of construct validity caused by reductionism, with which Gestalt psychologists and Vygotsky were so concerned.

The Problem of Reductionism

Reading Vygotsky's critique of reductionism in psychology, it is possible to find three types of reductionism that he criticized. The first two types can be called *vertical reductionism* as they involved either reduction of a higher-level phenomenon to a lower-level unit of analysis (e.g. behaviorism) or applying higher- level units of analysis to a lower-level phenomenon, which Wertsch called 'cultural reductionism' (Wertsch, 1985a, p. 43). In the latter case of vertical reductionism, any human psychological process is explained solely on the basis of mastery of symbolic means or sociocultural practices, ignoring biological and physical forces and constraints that can be involved in the phenomenon. Vygotsky associated vertical reductionism from higher to lower processes with 'vulgar materialism' and positivism, and vertical reductionism of ignoring lower-level processes with idealism. Finally, it is possible to track Vygotsky's critique of another type of reductionism that can be called *horizontal reductionism*, which involves treating a part of a system as if it is the self-contained and isolated whole. Unlike the vertical reductionism confusing the qualitatively different levels of the phenomenon, horizontal reductionism treats a part as the self-sufficient whole at the qualitatively same level. For example, Vygotsky (1987) criticized traditional psychology for neglecting analysis of relations among psychological functions:

> Of course, the idea that consciousness is a unified whole with the separate functions existing in insoluble connection with one another is nothing new for psychology. Indeed, it is as old as psychology itself. Nearly all psychologists note that the mental functions act in unbroken connection with one another. Remembering presupposes the activity of attention, perception, and the attribution of meaning. Perception requires attention, recognition (or memory), and understanding. In both traditional and contemporary psychology, however, this concept of the functional unity of consciousness—of the insoluble connections among the various aspects of its activity—has consistently remained on the periphery. Its most important implications have not been recognized. Moreover, psychology drew inferences from this concept that seems to be in direct opposition to those that should flow from it. Having established the interdependency of functions (i.e., having established the unity of the activity of conscious awareness) psychology continued to study the activity of the separate functions, ignoring their relationships. (p. 188)

To address the issue of methodological reductionism, Vygotsky insisted that analysis of complex structured processes has to be done using *'unit'* rather than 'element' (Valsiner, 1988, p. 130). Vygotsky argued for partitioning psychological processes into parts that preserve *the whole of the phenomenon*. He called the smallest part preserving the whole of phenomenon a 'unit'. To avoid terminological confusion, I call it '*the unit of the phenomenon*' (see Table 1 for an example of the application of the notion of the unit of phenomenon and unit of analysis among famous researchers in psychology). If we apply this newly developed term, Vygotsky's requirement means that *the unit of analysis has to be the unit of the phenomenon*. It is important to emphasize here that defining the unit of the phenomenon is *not* a methodological problem but a conceptual problem. It requires conceptual analysis to define what is the smallest part possessing all features of the phenomenon's whole.

Table 1. The relationship between the unit of phenomenon and the unit of analysis for various psychologists

Scholar	Targeted phenomenon	Unit of phenomenon	Descriptive unit of analysis
Vygotsky	Relationship between thinking and speech	Word meaning	Formation of a non-conventional new taxonomy concept using a nonsense word in a classification task
Köhler	The nature of individual intelligence	Use of roundabout ways to solve a problem	Behavior of an animal in problematic situations when roundabout ways are available to the animal
Piaget	Development of individual intelligence	Reversible mental operation	Infant's behavior after an object of the infant's interest has been covered with fabric
Thorndike	Human memory	Recall	Recalling unrelated and meaningless bits of information
Rogoff	Cultural patterns of attention	Attention management	Mother–infant reactions to meaningful events competing for their attention
Simon	Generalization of problem-solving	Transfer	Transfer of a specific way of problem-solving from a learned decontextualized problem to another, new decontextualized problem

The relationship between the unit of phenomenon and the unit of analysis is both conceptual and methodological. For example, Vygotsky argued that Thorndike and other associationists chose the wrong unit of analysis of memory because they overlooked the fact that meaning and symbolic mediation are crucial in the organization of human recall. Thus, they conceptually and methodologically reduced complex human memory based on the dynamic unity of cultural and biological processes to only biological processes—a case of vertical reductionism. As a result, they overlooked cultural organization of memory not only in their analysis but also in their method, as some of the participants of their studies might tacitly use mediation for recalls. This vertical reductionism can be corrected by scaling down the targeted phenomenon. If the associationists had defined their targeted focus of research as non-mediated memory on arbitrary demand (and guaranteed it through their methodological design), their unit of analysis could have been appropriate.

The latter point brings us to the issue of what phenomenon is worth studying and 'worth' for what. According to a sociocultural framework, this question cannot be addressed within purely methodological considerations as it both involves conceptual (paradigmatic) debates within the academic field and is shaped by practical needs and financial (and political and institutional) pressure outside of the field and science in general (Latour, 1987).

Reductionism in the social sciences is a very old problem. James Baldwin (1930) articulated it in the following way:

> To one to whom, however, the psychological problem was the central one, the interest in biological evolution was secondary to that in genetic psychology. In the latter, two great problems presented themselves; first, that of method: how can the development of the mental order of phenomena—or that of any other truly genetic order, involving progress—be fruitfully investigated? The Spencerian or quantitative method, brought over into psychology from the exact sciences, physics and chemistry, must be discarded; for its ideal consisted in reducing the more complex to the more simple, the whole to its parts, the later-evolved to the earlier-existent, thus denying or eliminating just the factor which constituted or revealed what was truly genetic. Newer modes of manifestation cannot be stated in atomic terms without doing violence to the more synthetic modes which observation reveals. The qualities of flower and fruit, for example, cannot be accounted for, much less predicted, from the chemical formulas of processes going on in the tissue of the fruit tree. (p. 7)

In my view, the problem of reductionism—studying a higher-level phenomenon at a lower-level unit of analysis—is primarily not methodological but rather a problem of the researcher's focus and the

goal of the study (which also interacts with the goals of the studied practice). Baldwin pointed out the issues of method and the research goal—what is worth studying. Although I agree with him, I think that the order of the importance of these issues must be reversed. The research method follows the research goal. The research goal is primary. Although most researchers would agree that the research goal is of primary importance, in practice it is often the research methodology which drives the goal. The researcher's goal, in its own turn, is often embedded in institutional practices that generate agendas for the researcher. Let's consider this claim in detail using a somewhat crude but useful sociological and historical analysis.

In the first half of the 20th century, behaviorists defined the goal of psychology (if not all social sciences) as 'to control and predict behavior' (Hartmann, 1992). The question, 'whose behavior and who is going to control it?' reveals both the political and economic basis of behaviorism. The strong dominance of behaviorism in psychology (and in many other areas of social sciences) is probably associated with industrial production during the first half of the 20th century. Industrial production manifested itself in assembly lines requiring rigid organizational structures. It put strong hierarchal, rigid and non-negotiable demands on all participants, but especially on those in low ranks. They had to fit the organization machine (Bennett, 1990; Glasser, 1972; Reich, 1992, 2001; Whyte, 1956). It is still alive nowadays. When the inquiry question is how to fit participants to the rigid, non-negotiable, hierarchical organization machine, behaviorism is probably the only useful methodology. For example, as soon as a researcher asks the research question 'how to motivate students to do homework' without consideration of the nature of the homework, its usefulness for the students, the organization of the classroom and school, the place of school and homework in the students' lives and their communities, and so on, he or she is trapped into reducing the student to an object of pedagogical actions. Again the researcher neglects inquiries about the nature of homework often not because he or she makes an error or is not a keen observer, but because the traditional school institution renders these important inquiries irrelevant due to its rigid, hierarchical and non-negotiable structure. Indeed, why ask about the nature of homework—if it is useful for particular students at a particular time, how it is situated in the lives of the students, can students participate in defining their homework, and so on—if the homework is not negotiable and even out of the teacher's own control? It is not by chance that although behaviorism is 'dead' in mainstream psychology, it is alive and well in education, especially in classroom

management and special education. Again, when the institutional goal is to make the student do what the teacher wants him or her to do without any negotiation, behaviorism is probably the best method to address this goal.

Still, behaviorism, although extreme, is only one of several possible manifestations of reductionism. Rationalism, positivism and reductionism are probably associated with governance by 'management of populace' (Foucault, 1984) and bureaucratization (Weber, 1947) as they systematically treat people (clients) as objects of their unilateral actions and decontextualize the people from their own lives and from relations with others. For example, the rise of IQ testing in the US was associated with new needs to bureaucratically sort people for military service (in World War I), immigration, mental institutions and schools (Gould, 1996). IQ testing aimed to help institutional bureaucrats and managers find where potential participants fit the institution rather than whether the institution fits the potential participants or how roles and practices are mutually negotiated as novice participants join established institutions. The latter research inquiries cannot be addressed using the reductionist IQ methodology.

When in the later 1940s and early 1950s, new ways of mass production emerged in the US that transformed the middle class into 'people with choice' or 'choice-oriented people'—regarding what to buy, where to live, what to wear,—(Bennett, 1990; Glasser, 1972; Reich, 1992, 2001), behaviorism was supplanted by information-processing cognitivism as the dominant position in psychology. Politically and economically, people were now seen as active decision-makers rather than as passive responders to environmental stimuli. The cognitive revolution in psychology brought a new methodology that viewed people as being active (Bruner, 1986). However, the activity of the new middle class was limited to *given* choices presented to them and *given* problems to be solved that were set by powerful (but often invisible) others. Thus, for example, along this cognitivist approach to education, Doyle (1986) defines the academic curriculum as special non-negotiable tasks assigned by the teacher for students:

> From the theoretical perspective . . ., the curriculum exists in the classroom in the form of academic tasks that the teacher assigns for students to accomplish with subject matter. . . . The concept of 'task' . . . calls attention to four key aspects of the school-work students do in classrooms: a goal state or end product to be achieved, a problem space or a set of conditions and resources available to accomplish the task, the cognitive operations involved in assembling and using resources to reach the goal state, and the importance of the work to be done [to get credit in the form of grades or points]. (pp. 365–366)

Decontextualized problem-solving (but not problem-defining!) became a unit of analysis in the new cognitivist methodology (Lave, 1988). A new type of reductionism emerged in the social sciences. If, in the first half of the 20th century, psychology was dominated by vertical reductionism, in the second half of the 20th century, it was dominated by horizontal reductionism, which I am going to discuss in the following section.

The Individual as a Wrong Unit of Analysis

Cognitive (and other) methodologies have been often criticized by sociocultural scholars as wrongly having the 'individual as the unit of analysis' (Cole, 1996; Lave, 1988, 1992; Rogoff, 1990; Wertsch, 1991). However, in a narrow and literal sense, the criticized researchers do not use the individual as the unit of their analysis. Rather, they often use individual *properties* as units of their analysis. As Rogoff (1990) correctly wrote, 'From the sociohistorical perspective, the basic unit of analysis is no longer the (properties of the) individual, but the (processes of the) sociocultural activity, involving active participation of people in socially constructed practices' (p. 14). Intelligence measured by IQ, (extrinsic/intrinsic) motivation, attention deficit, and so on, is an example of such properties of the individual.

What is wrong with studying psychological properties of the individual as the unit of analysis? The problem is that studying psychological properties means that the individual is never fully self-sufficient and independent—they are a part of a system. Let me illustrate this with a historical example. In many countries, where the writing system involves writing from left to right, right-hand writing historically was considered *the* appropriate form. This practice was facilitated by the fact that for the majority of people, the right hand is more active than the left. However, there were always a minority of children for whom the left hand is more active than right one. Since the early 1960s, it has been well documented in psychological and educational research that many of these left-handed children have had difficulties in learning how to write. Their writing skill/development was delayed and perplexed in comparison with the majority of right-handed students. The problem was formulated as a learning disability in writing among left-handed students (Benson, 1970). Thus, the problem was seen by researchers (and educators) as rooted entirely in the individual and the individual's psychological properties. In the late 1970s in the US (and many other countries), the pedagogical practice of teaching writing started changing. Mandatory right-handed writing was abandoned.

Many of the left-handed children were instructed in how to write using their left hand. The situation dramatically changed as the 'left-handedness problem in writing' mainly disappeared (when a problem remains, it is usually understood as an educational problem for teachers—how to support learning how to write for left-handed children) (Kelly, 1996).

Right- and left-handedness are *biologically* rooted differences (properties) of individuals—they are biological phenomena. However, in order to become *psychological* phenomena, these individual differences have to make a difference in human activities such as school instruction of writing. I agree with Bateson (1987), who pointed out that one difference is not enough to make 'information'. When human practice changes, biological differences may become irrelevant or differently relevant—as was in the case of school writing instruction of left-handed students. In the latter case, the problem rooted in the left-handed students was re-formulated as a problem of diversified and sensitive instruction and appropriate teacher education. Problems like dyslexia or learning disabilities, although they may be rooted in the brain, won't exist without specific systems of literacy and schools. Obviously, without any literacy system in a society, dyslexia does not exist, even though well-documented brain differences still remain in the population. Such a biological problem as blindness can only be an obstacle for reading when a literacy system is based on visual signs—when, however, a literacy system is based on dactyl signs, as in Braille, blindness is not a problem for reading (Vygotsky, 1993). Even more, when systems of literacy or schooling culturally or institutionally vary, dyslexia or learning disabilities vary as well, or do not exist in some cases. Thus, Italian dyslexics read more accurately than do French or English dyslexics, although they have identical brain differences, because the Italian literacy system (and probably language) provides fewer orthographic challenges for dyslexic readers than do the English and French ones (Paulesu et al., 2001). Even within the same cultural community, reading unfamiliar medical text with long Latin words probably makes different demands on a dyslexic reader than does reading chat messages in Instant Messenger.[3]

All human practices without exception are distributed among people, semiotic and tool mediators, time, space and physical environment. Limiting the unit of analysis to individual traits, functions, mechanisms, processes and properties neglects these human practices that are the core (together with the biological system of the human body and its ecology) of any psychological phenomenon. The negative consequences of such theoretical and methodological approaches are

both conceptual and practical. The conceptual problem of focusing on the individual as the unit of analysis comes from the fact that individual differences cannot fully map onto the studied psychological phenomenon as they are always only a part of it. The practical problem of focusing on the individual as the unit of analysis emerges as a person is often biologized and, as a consequence, often medicalized because in order to solve psychological problems, the researcher focuses only on how to change the individual (even maybe through the change of the practice) and not on how to problematize and change the system of the practice itself that always contributes to the psychological problems. For example, it is often the student who is targeted to be changed in response to a classroom problem through medical, behavioral, motivational, punitive and/or cognitive means rather than also considering changing the existing instruction and/or educational system or even the targeted practice itself (the latter is a non-educational approach to providing access to socially valuable practices). In many mainstream schools, the individual student (rather than a system of classroom practices) is often the object of the teacher's pedagogical actions (Matusov, St Julien, & Hayes, 2005). Focusing on the individual as the unit of analysis blinds researchers and educators from seeing the systemic complexity of psychological phenomena and from considering systemic solutions to complex psychological and social problems. To avoid horizontal reductionism, Vygotsky and sociocultural scholars call for critical investigation of the extent to which the unit of the phenomenon (and thus the unit of analysis) used in a particular research is holistic and sufficient.

Using the individual as the unit of analysis causes horizontal reductionism because the problem is not about levels of the phenomenon but rather about the whole of the phenomenon itself. The vertical reductionism often can be fixed by shifting to a different and appropriate level. For example, it is possible to find a phenomenon—for example, a chemical reaction—for which atoms of water are the appropriate unit of analysis. In this sense, study of atoms may not be useful for understanding the transparency of water, but it can be useful for understanding chemical reactions. In contrast, horizontal reductionism is not fixable in this way. When the unit of analysis is individual, any psychological phenomenon becomes destroyed because it loses its unity, holism and cohesiveness. When horizontal reductionism is committed, it is unfixable.

Does this mean that an individual cannot be studied? Of course not—an individual can be studied, but the individual should not be the self-contained unit of analysis. Fortunately, the findings of studies in

which the individual is the unit of analysis are not necessarily useless, but they have to be re-thought to take into account previously invisible and unaccountable processes and practices in which participants were involved. For example, the findings of early research on IQ in the US have become better understood in the context of anti-immigrant, anti-minority and anti-poor policies in the 1920s and 1930s (Gould, 1996). This new analysis develops a new unit that involves systems of practices rather than the intellectual properties of one individual. It appears that analysis of any psychological phenomenon has to be based on such a holistic unit of analysis.

Holism: An Impossible Methodological Task

Now, let us to return to the beginning of this article, where I listed attempts by sociocultural researchers to define a holistic unit of analysis. It is apparent that sociocultural scholars try to find the holistic unit of analysis and in doing so they are embracing bigger and bigger systems of practice, community, relations and culture. Studies of people participating in concrete practices like biology labs, sea vessel navigation, post office work, data entry of insurance claims, and so on, reveal a hybrid nature of practices: practices are inherently interconnected in networks (Latour, 1987). Ongoing economic, political and social globalization makes this hybrid and network nature of practices more visible (Stiglitz, 2002). Moreover, these networks spread not only in space (cultures/institutions) but also in time (history). Each new candidate for the unit of analysis in sociocultural research sooner or later becomes recognized by sociocultural scholars as 'too small'. A unit that preserves the whole of the phenomenon, as Vygotsky and Gestalt psychologists insisted, seems to resist having its boundary and limit. Here I argue that the opposite pitfall to reductionism is *holism*, proposed by Gestalt psychologists and Vygotsky (see Table 2). Although, from a sociocultural framework, holism is a less dangerous pitfall than reductionism, it is dangerous nonetheless.

Table 2. Summative comparison of the two major methodological approaches to the unit of analysis in the social sciences

Pros and cons	Reductionism	Holism
Strengths	Manageability	Systematicity
Unique weaknesses	Neglect of the whole	Unmanageable
Shared weaknesses	Universalism, monologism, objectivism, hegemony, self-contained nature of the unit of analysis	

Discussions of the Cultural-Historical Special Interest Group (SIG) at the American Educational Research Association (AERA) annual conference in April 2004 suggest that sociocultural scholars see some problems in this holistic gigantism (Engeström & Lee, 2004). It becomes clear that expanding the unit of analysis is more holistic but less manageable. Researchers simply cannot study everything and 'travel' unlimitedly over open networks of practices to trace their hybridity as well as multiple affiliations of their participants. Addressing this concern, Yrjö Engeström half-jokingly proposed that the unit of analysis in sociocultural research should be no bigger than a pumpkin so you can grab it with two hands. Using a dialectical approach (Ilenkov, 1977), Engeström proposes to limit the unit of analysis by including essential dialectical contradictions constituting the phenomenon. However, exactly this dialectical approach has led him to shift from activity as the unit of analysis (Engeström, 1988), to activity system (Engeström et al., 1999), to, currently, activity systems (Engeström & Lee, 2004). Besides, historically, researchers' concerns about the manageability of the unit of analysis have often led them to reductionism. (Remember the joke about a drunk who was searching for his lost wallet under a lamp-post not because the wallet was lost there but because it is easier and 'more manageable' to search for it there.)

Another approach to the problem of the manageability of the unit of analysis was introduced by Barbara Rogoff (1995). She coined a new methodological term, 'planes of analysis' (or 'lens of analysis'), to attract our attention to the possibility that a researcher can study only a part of the unit of analysis—a 'foreground plane'—in detail while keeping the rest of the unit in the 'background'. For example, she suggests that individuals can be studied on an 'individual plane' as long as interpersonal relations and communal practices are kept into account in the background. Individual learning is described as transformation of participation in a sociocultural activity. Although the research focus can be on the individual's participation in a given activity, this participation and this activity cannot be fully described and understood without the researcher's consideration of interpersonal relations and the entire community spread over physical and semiotic time and space. This consideration constitutes the 'background' of the study while the research focus on the individual's participation constitutes the 'foreground'. Similarly, interpersonal relations can be studied in the foreground of the study while keeping in the background consideration of individual contributions and institutional practices and norms. Rogoff still insists that activity is the

appropriate unit of analysis, but she makes the sociocultural research more manageable by the introduction of 'the three planes of analysis', which explicitly remind us of Bronfenbrenner's (1979) ecological model, though with some important differences. In contrast to Bronfenbrenner's levels, which are self-sufficient and have fixed boundaries, Rogoff's planes of analyses mutually constitute each other. Unlike holistic approaches, Rogoff's planes of analysis are completed and manageable. Unlike reductionist approaches, Rogoff's planes of analysis are not considered to be self-sufficient and the whole is not ignored. However, in her article Rogoff still seems to imply that her partition of sociocultural activity into the three planes is objective and absolute and not relational and relative: there are three planes, no more, no less, and there are exactly those three that she has spelled out. She also seems to believe that the three planes together constitute the definable (and, thus, I argue, unavoidably the universal) whole (i.e. 'sociocultural activity'). Still, as I will argue further, Rogoff's approach apparently offers important directions for solving the crisis regarding the search for the appropriate unit of analysis in sociocultural research.

It appears that the notion of 'the unit of analysis' is in crisis in the sociocultural field. I have to argue that this crisis is bigger than just the issue of the manageability of the unit of analysis. I see several other problems with the conceptual and methodological holism embraced by a sociocultural approach. It seems to me that a sociocultural approach should criticize cognitive and other approaches not only for making the *individual* the unit of analysis, but also for insisting on *the universal* unit of analysis, however holistic it might be. In addition to being universal, the unit of analysis in sociocultural research does not depend on the researcher, his or her goals and foci. Finally, the notion of 'the unit of analysis' is not interpretative. Although it is true that different sociocultural scholars have different units of analysis, their discourse is a suspiciously modernist discourse searching for the universal truth about *the true* unit of analysis *for any research* rather than interpretative discourse about the particular contexts and the particular foci of particular research. It seems that a sociocultural approach betrays itself with its strong emphasis on context. Half-jokingly sociocultural scholars claim that there is a universal answer to all questions in social sciences—this answer is, 'It depends.' The issue becomes what 'it' depends on. However, when asked about the unit of analysis, sociocultural scholars seem to abandon the 'it depends' contextual answer.

Besides being unmanageable and universalist, the discourse on the unit of analysis in a sociocultural field has another related problem of

being monologic and, thus, hegemonic. The sociocultural search for a uniting universal *It* as the unit of analysis is probably rooted in the monologism of Hegelian dialectics that Bakthin defined as murdered dialogue transferred into a head of one (more powerful) individual (Bakhtin, 1986, 1999). The issue here is of stratified power relationships between researcher and the people studied, which are actualized all the time in the official research accounts of published research (H. Pleasants, personal communication, August 2004). Bakhtin insisted that ideas are heavily embodied in people's biographies, relations with other people, and their future-oriented goals, desires and plans—they cannot (and should not) be fully appropriated by other people. From his dialogic perspective, people are always incomplete and insufficient (unfinalized) in all spheres (intellectual, emotional, volitional, etc.) and thus need each other. He reminded us that besides object of analysis, there is a subject of analysis that the researcher directly or indirectly addresses in his/her research (Bakhtin, 1986). The unit of analysis has to reflect not only the objectivity of the analysis but also its dialogic subjectivity. The defined unity—the Absolute Sprit in Hegel (1967) or the holistic unit of analysis in sociocultural research—does not exist and, arguably, it is not needed. If it is necessary to talk about unity, than it is open-ended unity, without limits. It is unity of an interpretative, particular and diverse universe: a universe with nothing above it. What is a universe for one person is not a universe for another. What methodological consequences does this approach have? What does methodology without reductionism and holism look like?

A Sketchy Proposal in Conclusion: An Open and Unfinalized Unit of Analysis

How can a unit of analysis be manageable and holistic without the pitfalls of reductionism, holism and unversalism? In my view, Barbara Rogoff's (1995) idea of partial, incomplete and open 'planes of analysis' can be applied to the unit of analysis to address this issue. Based on her idea, I propose that units of analysis have to be always viewed as partial, incomplete and open. Unlike Rogoff's planes, I suggest that units of analysis are defined in part by the studied object, in part by the researcher's focus, in part by the audience of research and in part by the research participants (as distinct from the research object). Thus, there can be many (unlimited) units of analysis and all of them appropriate. *A* particular unit of analysis can be appropriate or inappropriate within a particular study but it does not need to be *the* unit of analysis for any sociocultural research.

In this approach, the unit of analysis is never self-contained and is always a part of a bigger system that constitutes the background of the study and has to be taken into consideration, as Rogoff argued. For example, recently my colleague Mark Smith and I studied pre-service teachers' narratives in their class web forum postings about minority children with whom they work during their teaching practicum as a part of their class on cultural diversity in education (Matusov & Smith, 2007). We were interested in how our pre-service teachers wrote about the children they work with. Following Bakhtin's scholarship on discourse, we wanted to examine the levels of finalizing, objectivizing, problematizing and subjectivizing that the pre-service teachers use in their narratives, and how these narratives may affect their instruction. We used several units of analysis to address our research questions. One of these units of our analysis was a student's web posting about their practicum children. We saw this unit not as a property of a self-contained individual student but rather as a part of many other related systems: the student's participation in the class, in the teaching profession, as a part of communal interactions, and so on. Although we considered these systems by, for example, describing the pedagogical regime of the class and discussing how it shaped the students' narratives about the minority children, we did not systematically study these systems, keeping them in the background of our studies (like Rogoff). This methodology makes analysis manageable, but not at the expense of losing systemic interconnections.

One of the consequences of such partial methodology is that it produces incomplete evidence and, thus, incomplete findings. Unlike the two other approaches guided by holism or reductionism, it does not claim to be certain and does not try to accomplish certainty within one given study but rather transforms the certainty one way or another, making some statements more or less likely, more or less certain, than before based on the findings. In the proposed partial methodology, certainty (in Latour's sense of becoming a 'black box') can be achieved through many studies focused on different parts of the system. This principle can be illustrated with the following (limited) metaphor from medical practice. Currently lasers are used to kill cancerous tissue within the brain. The problem is how to kill only cancerous tissue without damaging healthy tissue in the laser pathway. A special technique is used that applies several weak rays that cannot damage any tissue. These rays are crossed on the cancerous brain tissue. Since they are cumulative, their power becomes fatal for the tumor. Similarly, each study can provide 'weak evidence' with a lot of uncertainty of possible alternative explanations due to the incompleteness of their units of

analysis but together they may provide a rather convincing story, making alternative explanations implausible.

This new methodological approach has focused the attention of researchers not only on data analysis but also on *data synthesis*, since, due to its incomplete nature, the unit of analysis cannot be fully known before the research is started. The 'data collection' process creates proto-data which become data after the unit(s) of analysis/analyses is/are defined in the study. The idea of data synthesis is not new and has been already described by sociocultural scholars (see Rogoff et al., 1993 for a description and application of data synthesis methodology in their quantitative research) and conceptualized in the notion of 'grounded theory'(Glaser, 1995). The research focus cannot be fully developed before and outside of the research itself. The paradox of the research was already well articulated by Plato (1961) in the words of Socrates in *Meno* that the researcher does not fully know what she or he is looking for until the research is completed. To pretend that the data pre-exist analysis is to do data synthesis covertly without much critical awareness. Through this process of data synthesis, the units of analysis develop.

In the proposed methodology, the units of analysis are incomplete with regard not only to their object of the study, but also their subject of the study: to whom the study is addressed. A study should not just be a story about third persons for an academic community but also a dialogue with people who participated in the study: '[A] subject as such cannot be perceived and studied as a thing, for as a subject it cannot, while remaining a subject, become voiceless, and, consequently, cognition of it can only be *dialogic*. . . . Degrees of thing-ness and personality-ness' (Bakhtin, 1986, p. 161). Not only do study participants' voices have to be presented in the unit of analysis, but the analysis itself has to be presented and heard by the study participants. The issue is not how much the research participants agree or disagree with the researcher's analysis and findings about them (although it is also important); the issue is that the research participants have to have a chance *to reply* to this analysis and findings as much as it is possible in order to develop the dialogic truth of the research. Research has to empower its participants by giving them an opportunity to respond to its findings, and this response has to be a part of the research report. There is no last word for either the researcher or the research participants. The research report itself is a juxtaposition of these diverse words. By emphasizing participation of all of the people involved in the research, we might address concerns that the unit of analysis approach does not adequately address: the ways in which power

relationships are also a part of our constructions of ourselves and the world (H. Pleasants, personal communication, August 2004). As Bakhtin argued, truth does not just come from dialogue; truth is dialogue itself (Bakhtin, 1999; Sidorkin, 2002; Skidmore, 2000).

Similarly, the new approach problematizes the tradition of coding verification through intercorder reliability: agreement between two or more independent coders of the research data. A lack of agreement between the coders might indicate ontological and ideological tension between the coders rather than simply a reliability problem with the coding construct. For example, when a preoperational child 'codes' the amount of water being poured from one vessel to another as different while a Western adult 'codes' it as the same, this disagreement does not mean poor reliability of the construct of liquid amount per se. Rather, it signals a phenomenon of non-conservation of liquid amount in preoperational children and its conservation in adults. The notion of intercoder reliability valuing agreement over disagreement is predicated on the idea of the homogeneity of a research community, which is a rather questionable assumption.

This proposal for a 'new' methodology based on open, incomplete and unfinalized units of analysis is vague, sketchy and lacking in important details (and illustrations). It is incomplete and 'weak'. It is not exactly 'new' methodology because many scholars using action research, feminist research and grounded theory often utilize these ideas. However, it is new in the sense of application to the unit of analysis. Following the spirit of the proposal, I hope that further debates about the unit of analysis and specific empirical research will help to improve and clarify the proposal.

Notes

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1. I use Valsiner's translation of this fragment of Vygotsky's work from Russian because it seems to me more accurate than Minick's translation (Vygotsky, 1987, p. 45).
2. This case can be illustrated by a joke about a drunk who looks for his lost wallet under a lamp-post in a dark park not because he lost the wallet there but because of the light that helps the search.
3. This is my hypothesis—I am unaware of any study that has tested it. The Instant Messenger is one of the most popular current systems of Internet 'chat'—synchronous Internet communication—in the US. Sometimes in the

US, it is used to refer to any synchronous writing-based telecommunication (including even the texting of cellular phones).

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Biography

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